



Air Force Plant 4

Operated by Lockheed Martin Tactical Aircraft Systems, Fort Worth, Texas

Phytoremediation Fact Sheet

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The purpose of this fact sheet is to briefly summarize the current status of phytoremediation technology, while focusing on the use of trees to clean up contaminated soil and water. This fact sheet will discuss two phytoremediation projects: Naval Air Station Fort Worth Joint Reserve Base (NASJRB) and Landfill No. 3 at Air Force Plant 4 (AFP 4), located in Fort Worth, Texas. The progress of these projects will be highlighted in this fact sheet.

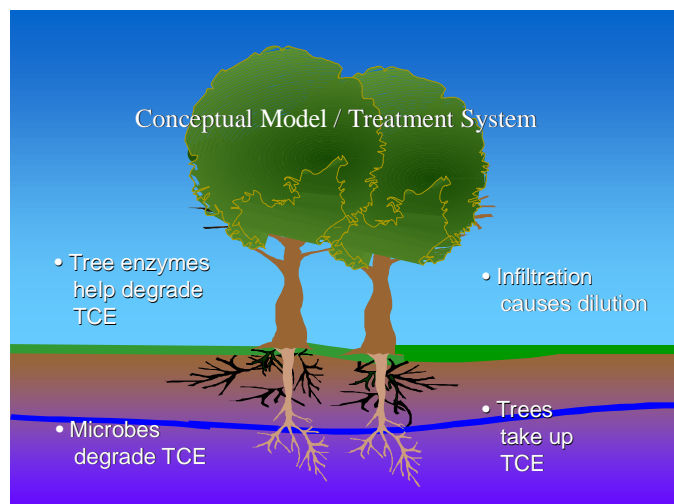
Overview

One of the newest and most innovative technologies for groundwater clean up is phytoremediation, a process that uses plants and trees to clean up contaminated soil and water. Growing and, in some cases, harvesting plants on a contaminated site as a remediation method is an aesthetically pleasing, solar-energy driven, passive technique. Phytoremediation can be used along with, or in some cases, in place

of mechanical clean-up methods. It involves planting trees in areas where the water is relatively close to the ground surface. The trees are selected based on their ability to absorb large amounts of groundwater, degrade the contaminants for use as nutrients, and release the water into the atmosphere through their leaves. Studies show that certain plants can break down organic pollutants by acting as filters or traps. Plants capture contaminants, such as trichloroethylene (TCE), a degrading agent used to clean airplane parts, and release clean air through evaporation in the leaves. TCE is a widely

used organic solvent and is among the most common of the toxic substances found at the hazardous waste sites on the Environmental Protection Agency's (EPA) *National Priority List*. In the past, the primary method for removing TCE from groundwater was the "pump-and-treat" approach. This technology is costly to build and maintain. Therefore, alternative approaches, such as phytoremediation, are greatly needed to remove solvents from soil and groundwater.

Phytoremediation is receiving increased attention from scientists and regulators as an approach to cleaning up contamination. It appears to be more economical than chemical and engineering-oriented methods and may also offer immediate and long-term environmental benefits. Phytoremediation can be used to clean up metals, pesticides, solvents, explosives, crude oil, and other contaminants, according to the EPA.



Phytoremediation at NASJRB

Groundwater under the NASJRB and the adjacent AFP 4 was contaminated with TCE decades ago through past industrial practices. Phytoremediation is being tested as a solution to TCE contamination at NASJRB in Fort Worth, Texas, and at Arnold Engineering Development Center in Tullahoma, Tenn. Two groves of trees used in the demonstration are monitored for their ability to pull up groundwater. The trees planted at NASJRB are eastern cottonwoods, a type of poplar, and are planted in an area where the groundwater is 10-12 feet below the surface. The levels of TCE encountered at NASJRB are usually less than one part per million; this is like having one Canadian penny in ten thousand dollars worth of American pennies. Due to its success and unique approach to environmental remediation, NATO recently chose the NASJRB phytoremediation project as a case study. A similar, but smaller, phytoremediation project is under construction for Landfill No. 3 at AFP 4.

Phytoremediation at Landfill No. 3

This project at Landfill No. 3 is part of an ongoing Air Force effort to define the applications of phytoremediation. It employs trees in areas of much higher concentration of contamination than those normally encountered at NASJRB. Information gathered will provide insight into trees as a solution to high, multiple-solvent conditions. If successful, it may be possible to employ trees as a cost effective and sustainable remediation approach to control contamination source areas.

This project entails planting trees along the Bomber Road portion of AFP 4's Landfill No. 3, between the road and the landfill fence. The planting portion of the project resulted in the placement of 190 "cottonless" cottonwood trees at the west end of the landfill gate; the north end of the planting area received 50 oak trees. The project also requires the installation of additional

monitoring wells, to better define groundwater flow conditions and levels, and a drip irrigation system to nourish the trees. An assessment of flow conditions and baseline chemistry tests are planned to help determine the effectiveness of the project at the site.



Questions about phytoremediation technology or to learn more about AFP 4 can be directed to the Aeronautical Systems Center, Wright-Patterson AFB, Ohio, 1-800-982-7248. Call either George Walters, ext. 416 or Greg Harvey, ext. 302 or you can visit the ASC Environmental Management home page at <http://www.ascem.wpafb.af.mil>.